Chapter 9
Alternatives to Take

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Acronyms and Abbreviations

af	acre-feet
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CM	Conservation Measure
CVP	Central Valley Project
ESA	Endangered Species Act
GIS	geographic information system
HCP	habitat conservation plan
HCP Handbook	Habitat Conservation Planning and Incidental Take Permit Processing Handbook
NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OMR	Old and Middle River
ROA	Restoration Opportunity Area
SWP	State Water Project
USFWS	U.S. Fish and Wildlife Service

Chapter 9
Alternatives to Take

[***Note to Reviewers**: This chapter is new since the November 2010 administrative draft BDCP so no revisions are tracked. This chapter addresses the specific regulatory requirement of Section 10 of the ESA for an HCP to consider alternatives to the taking of covered species. As such, the analysis in this chapter is qualitative in nature and comparative to the proposed project. The effects of alternatives on a range of environmental resources will be considered in the EIR/EIS. This draft provides an overview of the purpose of the chapter, identifies the alternatives to take that will be analyzed, and describes the approach to the qualitative analysis. Reviewers should provide comments regarding these components of the chapter. A complete version of this chapter will be distributed for review in the upcoming months.*]

9.1 Introduction

The BDCP has been designed to address federal Endangered Species Act (ESA) and California Natural Community Conservation Planning Act (NCCPA) compliance for the operation of the State Water Project (SWP) Delta facilities, including the construction and operation of new conveyance facilities for the movement of water entering the Delta from the Sacramento Valley watershed to the existing SWP and federal Central Valley Project (CVP) pumping plants in the south Delta. The BDCP has also been designed to provide for the conservation and management of covered species through a comprehensive set of conservation measures within the BDCP Plan Area. These measures include actions achieve the Plan's goal of restoring and protecting water supply, water quality and ecosystem health (Chapter 3, *Conservation Measures*).

As part of the development of the BDCP, a broad range of alternate approaches to achieve the Plan's co-equal goals of ecosystem restoration and water supply reliability were identified and evaluated by the plan participants. Among the approaches considered were those that would cause less incidental take of covered species, including species listed as threatened or endangered under the ESA, than would be expected to occur under the proposed actions of the BDCP. Consistent with the requirements of the ESA, this chapter describes alternatives considered during the development of the BDCP that would result in less incidental take of species covered by the Plan and sets out the reasons such alternatives were not adopted as the proposed project.

9.1.1 Regulatory Background

The ESA requires that Section 10 permit applicants specify in habitat conservation plans (HCPs) what alternative to the taking of federally listed threatened and endangered species were considered and the reasons why those alternatives to take are not proposed (50 CFR 17.22(b)(1)(iii)(C)). This chapter addresses this requirement by identifying and analyzing a range of

alternatives that would avoid or reduce the level of take of the covered fish and wildlife species likely to result from the proposed project[1].

The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (HCP Handbook) (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996) provides guidance to applicants regarding the approach that should be followed in the analysis of alternatives. Specifically, the HCP Handbook identifies two types of alternatives that are typically considered in HCPs: alternatives that would result in take levels below those anticipated for the proposed project, and alternatives that would cause no incidental take, thereby eliminating the need for an incidental take permit. The evaluation of alternatives to take is a requirement solely of the ESA (the NCCPA requires that project alternatives be considered in the EIR but not in the Natural Community Conservation Plan [NCCP]), necessitating the evaluation of take associated with federally listed species. The following description and analysis of alternatives to take have therefore been developed solely for the purpose of meeting the requirements of Section 10 of the ESA.

As part of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) process, a wider range of project alternatives have been identified and evaluated against the full range of environmental resources. The analysis of alternatives to take in this chapter serves a specific and narrow regulatory purpose, which is separate and apart from the analysis of project alternatives under NEPA and CEQA. The EIS/EIR for the BDCP identifies a reasonable range of alternatives to the BDCP and evaluates the potential environmental effects of those alternatives in relation to the proposed project.

9.1.2 Evaluation Process

The BDCP reflects the culmination of a multiyear effort to achieve the Plan's goal of restoring and protecting water supply, water quality, and ecosystem health in the Delta. The planning process included a systematic and in-depth evaluation of a wide range of conceptual approaches to advancing these goals. These approaches differed largely in terms of the type of water conveyance infrastructure that would be employed and the nature and extent of habitat protection, restoration, and enhancement actions that would be implemented. During the development of the BDCP, the most promising elements of these approaches were synthesized into the proposed project, which integrates significant actions to modernize water conveyance infrastructure into a comprehensive conservation strategy designed to contribute to the recovery of Delta species.

The BDCP conservation strategy consists of multiple components that have been developed to collectively advance the co-equal planning goals and achieve a broad set of biological goals and objectives. The conservation strategy sets out these biological goals and objectives and establishes the actions to achieve them, including conservation measures and a monitoring, research, and adaptive management program. When implemented together, the specific conservation measures are expected to provide for the conservation and management of the covered species. (For a detailed history of the development of the BDCP conservation strategy and its key components, see Appendix D, *Background on the Process of Developing the BDCP Conservation Measures.*)

[1] Under the ESA, it is unlawful to remove or reduce to possession, or maliciously damage or destroy any endangered plant under federal jurisdiction (16 USC 1532(8) and 1532(14)), which the Court has interpreted to mean only on federal land.

The alternatives to take identified and analyzed in this chapter are based on the various conceptual approaches considered during the course of the development of the BDCP. These alternatives incorporate approaches to water conveyance that differ from the proposed project primarily in the type of physical conveyance facility infrastructure and improvements, the location of facilities, and operational criteria for these conveyance facilities and improvements as described in Conservation Measure (CM) 1 (Table 9-1). With the exception of the No Action Alternative, each alternative analyzed in the chapter would involve the construction of new conveyance facilities and improvements to the existing SWP and CVP south Delta export facilities. Additionally, each alternative would include operational criteria for the water supply infrastructure and habitat conservation components. The alternatives also vary from the proposed project in the extent of habitat restoration and enhancement, as described in CM4 Tidal Habitat Restoration, CM5 Seasonally Inundated Floodplain Restoration, and CM6 Channel Margin Habitat Enhancement. For all alternatives to take, restoration would occur within Restoration Opportunity Areas (ROAs) (Figure 9-1).

Alternative approaches to other conservation measures were also considered, but not included in the final alternatives to take. Conservation measures such as CM3 Natural Communities Protection and the measures to reduce other stressors to covered species (CM12 through CM23) have only neutral or beneficial effects on every covered species. Changing or removing these measures would not result in reduced levels of take, only an increase or reduction in species benefits. As such, conservation measures and other covered activities not specifically identified in this chapter are held constant (i.e., the same as the proposed project) for each alternative to take.

The various approaches to water conveyance and habitat restoration were assembled in combinations to create complete alternatives to take that could be directly compared to the proposed project (Section 9.2, *Alternatives to Take*).[2] As such, each alternative includes one or more components that are different from the proposed project, allowing for a meaningful comparison. For each covered fish and wildlife species, the effect of changing these components was evaluated to assess if take could be avoided or reduced in comparison with the proposed project (Section 9.3, *Alternatives to Take by Species Group*). Each alternative was evaluated against the following three criteria.

- The level of incidental take expected to result and conservation benefits likely to accrue to each of the covered fish and wildlife species.
- Consistency with the BDCP overall goals and objectives of restoring and protecting water supply, water quality, and ecosystem health.
- Practicability with regard to cost, logistics, and technology.

Section 9.2, *Alternatives to Take* describes the alternatives to take and the methods used in the analysis, Section 9.3, *Alternatives to Take by Species Group* describes the evaluation of alternatives to take by species group, and Section 9.4, *Conclusions* provides the conclusions of the evaluation. The evaluation also describes why the various alternatives to take were not adopted in the BDCP.

[2] The activities that are proposed for regulatory coverage under the BDCP (Covered Activities) are generally reflected in the BDCP conservation strategy. Consequently, the alternative approaches to the BDCP conservation strategy incorporate alternative approaches to the Covered Activities that could potentially reduce take of listed covered species.

Table 9-1. Water Conveyance Facilities Components and Operations of Each Alternative

Water Conveyance Component	Alternative									
	PP[1]	A	B	C	D	E	F	G	H	I
Primary Conveyance Facility										
Pipelines/tunnels	X	X	X	X	X	X		X	X	
Canals		X								
Channels							X			X
New operable barriers				X			X			
Fish movement and habitat corridor around Clifton Court Forebay							X			
Other Water Facilities										
New North Delta intakes	X	X	X	X	X	X	X	X	X	
New intake pumping plants	X	X	X	X	X	X		X	X	
New diversion pumping plants							X			
New intermediate pumping plant	X	X	X	X	X	X		X	X	
Use of existing SWP and CVP south Delta intake facilities	X	X	X	X	X		X	X	X	X
Byron Tract Forebay[2]	X	X	X	X	X	X		X	X	
Intermediate Forebay	X		X	X	X	X		X	X	

[1] Proposed project

[2] Byron Tract Forebay currently refers to forebay both north and south of Clifton Court Forebay that would be constructed under the proposed project.

9.1.3 Relationship to the EIR/EIS

The EIR/EIS alternatives differ from alternatives to take in terms of regulatory basis, scope of evaluation, species considered, and level and standard of evaluation. EIR/EIS alternatives are required by CEQA and NEPA. They are considered for the proposed federal action (issuance of incidental take permits by USFWS and NMFS) and for the proposed state action (issuance of NCCP permit by the California Department of Fish and Game [CDFG]). As such, CEQA and NEPA alternatives considered are evaluated against the significance of impact according to CEQA criteria and NEPA guidelines. This expands the scope of the EIR/EIS evaluation to consider alternatives that avoid and lessen any significant impacts on the environment, not just impacts on covered fish and wildlife species. The species evaluation is expanded to include all species within the proposed Plan Area, with a focus on special-status species. In addition, alternatives must meet the proposed project objectives under CEQA and the purpose and need under NEPA, and be feasible. The EIR/EIS alternative evaluation is typically qualitative and quantitative. The alternative to take evaluation is intended to be entirely consistent with the evaluation of EIR/EIS alternatives but focused on covered fish and wildlife species. To maintain consistency between the two documents, the alternatives to take evaluation parallels the EIR/EIS alternatives analysis for equivalent or similar alternatives. The differences between the alternatives to take and the EIR/EIS alternatives are summarized in Table 9-2.

Table 9-2. Relationship between Alternatives to Take and EIR/EIS Alternatives

Alternative to Take and Description	Equivalent or Similar EIR/EIS Alternative	Difference between Alternative to Take and EIR/EIS Alternative
A Dual conveyance with west canal and intakes W1-W5	1C	No difference
B Dual conveyance with intakes 1–2 and reduced north Delta diversion capacity (6,000 cfs)	3	No difference
C Dual conveyance with intakes 1–3 and reduced north Delta diversion capacity (9,000 cfs)	4	EIR/EIS Alternative evaluates a different operational scenario for CM1. Alternative to Take maintains proposed project operations.
D Dual conveyance with 1 intake and reduced north Delta diversion capacity (3,000 cfs)	5	EIR/EIS Alternative evaluates a different operational scenario for CM1 and reduced tidal habitat restoration for CM4. Alternative to Take maintains proposed project operations for CM1 and proposed project tidal habitat restoration for CM4.
E Isolated conveyance with pipeline and intakes 1–5	6A	No difference

Alternative to Take and Description	Equivalent or Similar EIR/EIS Alternative	Difference between Alternative to Take and EIR/EIS Alternative
F Through Delta conveyance with Delta channel modifications and different intake locations	9	EIR/EIS Alternative evaluates changes in habitat restoration and enhancement for CM4 Tidal Habitat Restoration, CM5 Seasonally Inundated Floodplain Restoration, CM6 Channel Margin Habitat Enhancement, and CM7 Riparian Habitat Restoration. Alternative to Take maintains proposed project restoration and enhancement.
G Reduce tidal habitat restoration to 50,000 acres	No similar or equivalent alternative	No similar or equivalent alternative
H Increase tidal habitat restoration to 75,000 acres, seasonally-inundated floodplain restoration to 20,000 acres, and channel margin habitat enhancement to 40 linear miles	7	EIR/EIS Alternative evaluates changes in CM1 facilities and operations and maintains proposed CM4. Alternative to Take maintains proposed CM1, but evaluates increased tidal habitat restoration under CM4. Both the EIR/EIS alternative and Alternative to Take evaluate increased restoration under CM5 Seasonally-Inundated Floodplain Restoration and increased enhancement under CM6 Channel Margin Habitat Enhancement.
I No Action	No Action Alternative	No difference

9.2 Alternatives to Take

This section provides a description of each of the alternatives to take (Table 9-3). For each alternative to take, the conservation measures and their components that differ from the proposed project and that are relevant to the evaluation of effects on covered fish and wildlife species are identified and described. Components that are the same as the proposed project are not described. Similarly, components that differ among alternatives but do not change the conclusions regarding take of covered fish or wildlife species are not reported. This approach allows the reader to focus on the differences between the alternative and the proposed project that matter for the analysis. For some alternatives to take, a single conservation measure would be altered; for others, multiple conservation measures would be altered. A brief summary of how take would be different is provided in Table 9-3 and at the end of each alternative to take description. A detailed analysis is provided in Section 9.3, *Alternatives to Take by Species Group*. The rationale for why each alternative to take was not selected is provided in Section 9.4, *Conclusions*.

Table 9-3. Alternatives to Take Overview

*[**Note to Reviewer:** Upon completion of the alternatives to take analysis, the Change in Take column will indicate whether take is avoided, reduced, or increased for terrestrial and aquatic species.]*

Alternative to Take and Description	Primary Differences between Alternative to Take and Proposed Project	Change in Take (Avoided, Reduced, or Increased)
A Dual conveyance with west canal and intakes W1-W5	CM1 components: - Location and type of primary conveyance facility - Location of intakes and associated intake facilities - Number of forebays - Water facility components	Take of terrestrial species due to construction footprint of pipeline; take of terrestrial and aquatic species due to construction and operation of north Delta diversion facility
B Dual conveyance with intakes 1–2 and reduced north Delta diversion capacity (6,000 cfs)	CM1 components: - Number and location of intakes and associated intake facilities - Location of conveyances pipelines and initial tunnel between intake pumping plants and Intermediate Forebay - North Delta diversion capacity	Take of terrestrial and aquatic species due to construction and operation of north Delta diversion facility
C Dual conveyance with intakes 1–3 and reduced north Delta diversion capacity (9,000 cfs)	CM1 components: - Number and location of intakes and associated intake facilities - Location of conveyances pipelines and initial tunnel between intake pumping plants and Intermediate Forebay - North Delta diversion capacity	Take of terrestrial and aquatic species due to construction and operation of north Delta diversion facility
D Dual conveyance with 1 intake and reduced north Delta diversion capacity (3,000 cfs)	CM1 components: - Number and location of intakes and associated intake facilities - Location of conveyances pipelines and initial tunnel between intake pumping plants and Intermediate Forebay - North Delta diversion capacity	Take of terrestrial and aquatic species due to construction and operation of north Delta diversion facility

Alternative to Take and Description	Primary Differences between Alternative to Take and Proposed Project	Change in Take (Avoided, Reduced, or Increased)
E Isolated conveyance with pipeline and intakes 1–5	CM1 components: - Operation of existing SWP and CVP south Delta export facilities for Clifton Court Forebay and Jones Pumping Plant	Take of terrestrial and aquatic species due to construction and operation of north Delta diversion facility
F Through Delta conveyance with Delta channel modifications and different intake locations	CM1 components: - Location and type of primary conveyance facility - Number of intake pumping plants - Number of diversion pumping plants - Number of intermediate pumping plants - Number of forebays	Take of terrestrial species due to construction footprint of tunnel conveyance; take of terrestrial and aquatic species due to construction and operation of north Delta diversion facility
G Reduce tidal habitat restoration from 65,000 acres to 50,000 acres	CM4 components: - Amount/location of tidal habitat restoration	Take of terrestrial species due to tidal habitat restoration; more benefits to fish
H Increase tidal habitat restoration from 65,000 acres to 75,000 acres, seasonally-inundated floodplain restoration from 10,000 acres to 20,000 acres, and channel margin habitat enhancement from 20 linear miles to 40 linear miles	CM4 components: - Amount/location of tidal habitat restoration CM5 components: - Amount/location of seasonally inundated floodplain restoration CM6 components: - Amount/location of channel margin habitat enhancement	Take of terrestrial species due to tidal habitat restoration, seasonally-inundated floodplain restoration, and channel margin habitat enhancement; more benefits to fish
I No Action	Proposed project would not be implemented	Take of terrestrial and aquatic species due to not implementing the proposed project
Notes: cfs=cubic feet per second; SWP=State Water Project; CVP=Central Valley Project		

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9.2.1 Alternative A: Dual Conveyance Canal with West Canal, Intakes W1–W5

Alternative A would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM1 Water Facilities and Operation.

- Location and type of primary conveyance structure.
- Location of intakes and associated intake facilities.
- Number of forebays.
- Water facility components.

The other conservation measures would remain the same as under the proposed project. Under this alternative, isolated water conveyance would occur from the north Delta to the south Delta through a lined or unlined canal in the west Delta. The five intakes facilities and associated facilities (e.g., sedimentation basins, solids handling facilities, intake pumping plants and associated pipelines) would be located on the west bank of the Sacramento River and the Intermediate Forebay would not be required. The new water facility components would include the following elements.

- Conveyance pipelines between transition structures and canal transition structures with radial gates and stop logs.
- Lined or unlined canal between the intake pumping plants and an Intermediate Pumping Plant.
- An Intermediate Pumping Plant at the entrance of a tunnel would convey diverted water through the tunnel.
- A dual-bore tunnel extending 17 miles between the Intermediate Pumping Plant and a second canal segment.
- A lined or unlined canal between the tunnel exit portal and Byron Tract Forebay.
- Byron Tract Forebay adjacent to and north of Clifton Court Forebay.
- Connections to the Banks Pumping Plant and Jones Pumping Plant, including a canal between Byron Tract Forebay and the approach canals to the Banks and Jones Pumping Plants, and sets of gates in the approach canals upstream of the connection to the canal from Byron Tract Forebay.
- Eight inverted culvert siphons along the conveyance alignment to convey diverted water under ten existing shallow watercourses and one rail line.
- Sixteen bridge crossings along the conveyance alignment.
- Other road and utility crossings, including drainage and irrigation facilities.

A map and schematic depicting the conveyance facilities associated with Alternative A are provided in Figure 9-2 and Figure 9-3. The components are summarized in Table 9-1.

This alternative would result in water conveyance infrastructure effects different from the proposed project. The total footprint of the water conveyance infrastructure would increase by 3,700 acres (65%, from 5,700 to 9,400 acres), and the length would increase by 7 miles (16%, from 45 to 52 miles). The intake facilities impacts would be reduced by 400 acres (25%, from 1,600 to 1,200 acres) and would be limited to the west bank of the Sacramento River.

Use of isolated conveyance canals in place of tunnels would result increased surface impacts, but remove the need for the Intermediate Forebay. The Intermediate Forebay provides a hydrologic break for the tunnel and would not be required for a surface canal. The surface acreage disturbed for primary water conveyance would increase by 4,030 acres (1,089%), from 370 acres for conveyance tunnels to 4,400 acres for isolated conveyance canals and supporting infrastructure (e.g., culvert siphons, tunnels, roads). Canal conveyance requires culvert siphons to regulate surface waters that could flow into the canal, and tunnels where the canal segments significant bodies of water. In addition, a road would be built on either side of the canal for access and bridges would be required to cross the canal.

Alternative A would result in an increase in the total acreage affected by the water conveyance infrastructure. Overall permanent effects on natural communities would increase by XX% compared to the proposed project (Table 9-4); however, location-specific impacts on XX covered species, including XX, XX, and XX species, could be reduced. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

Table 9-4. Summary of Impacts by Natural Community and Alternative to Take

*[**Note to Reviewer**: This table will be populated with the results from the updated effects analysis, the EIR/EIS alternatives analysis and alternatives screening report]*

	Permanent Impacts								
		Alternative to Take							
Natural Community	**PP[1]**	**A**	**B**	**C**	**E**	**F**	**G**	**H**	**I**
Tidal perennial aquatic									
Tidal mudflat									
Tidal brackish emergent wetland									
Tidal freshwater emergent wetland									
Valley foothill riparian									
Grassland									
Inland dune scrub									
Alkali seasonal wetland complex									
Vernal pool complex									
Other natural seasonal wetland									
Non-tidal permanent freshwater emergent wetland									
Non-tidal perennial aquatic									
Managed wetlands									
Agricultural lands									
Total									
% Difference from conservation strategy									
[1] Proposed project									

9.2.2 Alternative B: Dual Conveyance with Intakes 1–2 and Reduced North Delta Diversion Capacity (6,000 cfs)

Alternative B would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM1 Water Facilities and Operation.

- Number and location of intakes and associated intake facilities.
- Location of conveyances pipelines and initial tunnel between intake pumping plants and Intermediate Forebay.
- North Delta diversion capacity.

The other conservation measures would remain the same as under the proposed project. Alternative B would comprise physical and structural components similar to those under the proposed project, but would require only two intakes and intake pumping plants (Table 9-1). Conveyance pipelines and the initial tunnel between the intake pumping plants and the Intermediate Forebay would be adjusted to the intake locations. Water conveyance operational criteria would be the same as the proposed project, except that this alternative would convey up to 6,000 cfs rather than 15,000 cfs from the north Delta. A map and schematic depicting the conveyance facilities associated with Alternative B are provided in Figure 4-4 and Figure 9-4. The components and operations are summarized in Table 9-1.

Alternative B would result in similar total acreage affected by the water conveyance infrastructure as the proposed project. Overall permanent effects on natural communities would increase/decrease by XX% compared to the proposed project (Table 9-4). Changes in number and location of intakes and related infrastructure and north Delta diversion capacity would result in reduced or avoided effects on XX covered species, including XX, XX, and XX species. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.3 Alternative C: Dual Conveyance with Intakes 1–3 and Reduced North Delta Diversion Capacity (9,000 cfs)

Alternative C would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM1 Water Facilities and Operation.

- Number and location of intakes and associated intake facilities.
- Location of conveyances pipelines and initial tunnel between intake pumping plants and Intermediate Forebay.
- North Delta diversion capacity.

The other conservation measures would remain the same as under the proposed project. Alternative C would comprise physical and structural components similar to those under the proposed project, but only three intakes and intake pumping plants would be constructed. Conveyance pipelines and the initial tunnel between the intake pumping plants and the Intermediate Forebay would be adjusted to the intake locations. This alternative could convey up to 9,000 cfs from the north Delta, rather than up to 15,000 cfs under the proposed project. A map and schematic depicting the conveyance facilities associated with Alternative C are provided in Figure 4-4 and Figure 9-5. The components are summarized in Table 9-1.

Alternative C would result in similar total acreage affected by the water conveyance infrastructure as the proposed project. Overall permanent effects on natural communities would increase/decrease by XX% compared to the proposed project (Table 9-4). Changes in number and location of intakes and related infrastructure and north Delta diversion capacity would result in reduced or avoided effects on XX covered species, including XX, XX, and XX species. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.4 Alternative D: Dual Conveyance with Intake 1 and Reduced North Delta Diversion Capacity (3,000 cfs)

Alternative D would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM1 Water Facilities and Operation.

- Number and location of intakes and associated intake facilities.
- Location of conveyances pipelines and initial tunnel between intake pumping plants and Intermediate Forebay.
- North Delta diversion capacity.

The other conservation measures would remain the same as under the proposed project. Alternative D would include physical and structural components similar to those under the proposed project, but only one intake and intake pumping plant would be required. Conveyance pipelines and the initial tunnel between the intake pumping plants and the Intermediate Forebay would be adjusted to the intake location. Water supply operations could convey up to 3,000 cfs from the north Delta. A map and schematic depicting the conveyance facilities associated with Alternative D are provided in Figure 4-4 and Figure 9-6. The components are summarized in Table 9-1.

Alternative D would result in similar total acreage affected by the water conveyance infrastructure as the proposed project. Overall permanent effects on natural communities would increase/decrease by XX% compared to the proposed project (Table 9-4).Changes in number and location of intakes and related infrastructure, and north Delta diversion capacity would result in reduced or avoided effects on XX covered species, including XX, XX, and XX species. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.5 Alternative E: Fully Isolated Conveyance with Pipeline and Intakes 1–5

Alternative E would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM1 Water Facilities and Operation.

- Operation of existing SWP and CVP south Delta export facilities for Clifton Court Forebay and Jones Pumping Plant.

The other conservation measures would remain the same as under the proposed project. Alternative E would include physical and structural components similar to those under the proposed project, but use of the south Delta intakes would be discontinued. This would eliminate the need for the operation of existing SWP and CVP south Delta export facilities for Clifton Court Forebay and Jones Pumping Plant. The water facility operation would discontinue use of the south Delta intakes and convey up to 15,000 cfs from the north Delta. A map and schematic depicting the conveyance

facilities associated with Alternative E are provided in Figure 4-4 and Figure 9-7. The components are summarized in Table 9-1.

Alternative E would result in reduced operational effects. Overall permanent effects on natural communities would increase by XX% compared to the proposed project (Table 9-4). This would decrease or avoid take of XX covered species. This includes XX, XX, and XX. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.6 Alternative F: Through Delta Conveyance with Delta Channel Modifications and Different Intake Locations

Alternative F would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM1 Water Facilities and Operation of the proposed project.

- Location and type of primary conveyance facility.
- Number of intake pumping plants.
- Number of diversion pumping plants.
- Number of intermediate pumping plants.
- Number of forebays.

The other conservation measures would remain the same as under the proposed project. Under this alternative, primary water conveyance would occur from the north Delta to the south Delta through separate channel corridors (Table 9-1). Construction of isolated pipeline or tunnel primary conveyance facilities, intake pumping plants, intermediate pumping plants, or forebays would not be required. Two fish-screened intakes would be constructed: one each at the Delta Cross Channel and Georgiana Slough. The intakes would be divided into bays to support consistent diversion capacity across the intake. Diversion pumping plants, rather than intake pumping plants, would be constructed. Water would travel through a flow collection channel and radial gates, eventually reaching the existing channel. Once in the channel, water would flow south through the Mokelumne River and San Joaquin River to Middle River and Victoria Canal, which would be dredged to accommodate increased volumes of water. Along the way, diverted water would be guided by operable barriers. Water flowing through Victoria Canal would lead into two new canal segments and pass under two existing watercourses through culvert siphons, eventually reaching Clifton Court Forebay. From there, water would flow through existing SWP facilities, and a new intertie canal would be constructed to connect the forebay to CVP facilities. Alternative F would include the following water conveyance-related facilities.

- Operable barriers on the Mokelumne River near Lost Slough and on Snodgrass Slough near the Mokelumne River, extension of Meadow Slough to the Sacramento River, and installation of an operable barrier on Meadow Slough. These facilities would provide a path for fish migration from the Mokelumne and Cosumnes Rivers through Lost Slough and Meadows Slough to the Sacramento River except during flood flows.
- On-bank diversions with fish screens at Delta Cross Channel and Georgiana Slough.
- A boat lock and channel at the diversion structure at Georgiana Slough.

- An operable barrier at Threemile Slough to reduce salinity in the San Joaquin River during low Delta outflow and potentially to reduce fish movement from the Sacramento River to the San Joaquin River.
- Operable barriers along Middle River at Connection Slough, Railroad Cut, Woodward Canal, and immediately downstream of Victoria Canal to isolate the south Delta separate water supply corridor from Old River.
- Dredging along Middle River (Mildred River to Victoria Canal) and Victoria Canal to provide for gravity flow into Clifton Court Forebay.
- Expansion and extension of Victoria Canal under West Canal, across Coney Island, and under Old River to Clifton Court Forebay.
- Intertie canal with a control gate between Clifton Court Forebay and the Tracy Fish Facility.
- Closure of the Clifton Court Forebay inlet gate from Old River except during flood flows.
- Closure of channel between Old River and the Tracy Fish Facility except during flood flows. Closure would include channel modification to allow continued access to River's End Marina from Old River.
- Operable barriers along the San Joaquin separate fish movement corridor at the upstream confluence of Old River and the San Joaquin River (Head of Old River), Fisherman's Cut at False River, and Franks Tract to isolate Old River (San Joaquin separate fish movement corridor) from the San Joaquin River.
- A pumping plant on the San Joaquin River at the Head of Old River to convey additional flows with organic material into Old River.
- A pumping plant on Middle River upstream of Victoria Canal to convey additional flows with lower salinity than Old River into Old River.

A map and schematic depicting the conveyance facilities associated with Alternative F are provided in Figure 9-8, Figure 9-9, and Figure 9-10. The components are summarized in Table 9-1.

The water supply operations of this conveyance facility could convey up to 15,000 cfs from the north Delta.

Alternative F would result in fewer water conveyance infrastructure effects than the proposed project. Overall, permanent effects on natural communities would decrease by XX% compared to the proposed project (Table 9-4). Effects on XX covered species, including XX, XX, and XX species, would be reduced. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.7 Alternative G: Reduce Tidal Habitat Restoration to 50,000 Acres

Alternative G would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM4 Tidal Habitat Restoration of the proposed project.

- Amount of tidal habitat restored.

The other conservation measures would remain the same as under the proposed project. The amount of tidal habitat restored would be reduced from 65,000 to 50,000 acres.

Overall permanent effects on natural communities would decrease by XX% compared to the proposed project. Changes in the extent of tidal restoration would result in reduced or avoided effects on XX covered species, including XX, XX, and XX species. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.8 Alternative H: Increase Tidal Habitat Restoration to 75,000 Acres, Seasonally Inundated Floodplain Restoration to 20,000 Acres, and Channel Margin Habitat Enhancement to 40 Linear Miles

Alternative H would avoid or reduce take for some covered fish and wildlife species by altering the following components of CM4 Tidal Habitat Restoration, CM5 Seasonal Inundated Floodplain Restoration, and CM6 Channel Margin Habitat Enhancement.

- Amount of tidal habitat restored.
- Amount of seasonal inundated floodplain restored.
- Amount of channel margin habitat enhanced.

The other conservation measures would remain the same as under the conservation strategy. Conservation components under Alternative H would be similar to those for the proposed project, but 75,000 acres rather than 65,000 acres of tidal habitat would be restored, 20,000 acres rather than 10,000 acres of seasonally inundated floodplain would be restored, and 40 linear miles rather than 20 linear miles of channel margin habitat would be enhanced.

Overall permanent effects on natural communities would increase by XX% compared to the proposed project (Table 9-4); however, the amount of tidal habitat restored would increase by 10,000 acres (15%), seasonally inundated floodplains restored by 10,000 acres (100%), and channel margin habitat enhanced by 20 linear miles (100%). This would result in increased benefits to XX covered species, including XX, XX, and XX species. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.2.9 Alternative I: No Action

Alternative I would avoid or reduce take for some covered fish and wildlife species without implementing the proposed project. This alternative would include continued operation of the SWP and CVP, ongoing conservation programs and policies by government and nonprofit entities, projections related to climate change, and annual actions that vary every year. Water conveyance operations would continue at the south Delta SWP/ CVP facilities with through-Delta conveyance only under currently authorized operational criteria (Table 9-1).

[***Note to Reviewers:*** *detailed description pending*.]

Overall permanent effects on natural communities would decrease by XX% compared to the proposed project (Table 9-4). Effects on XX covered species, including XX, XX, and XX species, would

be reduced. Species take avoided or reduced is discussed in Section 9.3, *Alternatives to Take by Species Group*.

9.3 Alternatives to Take by Species Group

[***Note to Reviewers:*** *detailed analysis pending*.]

This section summarizes how the level of take would differ for all covered fish and wildlife species by each alternative to take, with summaries provided in Table 9-5 through Table 9-11. The same alternative to take may eliminate, reduce, not change, or increase take of any particular covered species. It is important to understand how take would change by species as well as by alternative.

This section is organized by species group to facilitate review by the fish and wildlife agencies and enable their findings by species. For each species group, the alternatives to take that would avoid or reduce take are identified, and measures to avoid or reduce take are described. These descriptions and comparisons are based on quantitative data such as geographic information system (GIS) overlays of species habitat distribution models, modeling results of operations scenarios on key stressors of covered fish, and best professional judgment. The modeling tools used are the same in most instances as those used in Chapter 5, *Effects Analysis*, but described in much less detail to enable easy comparisons (more detailed comparisons are provided in the EIR/EIS).

Table 9-5 through Table 9-11 summarize the outcomes of the alternatives to take analysis, including the net effect of each alternative, evaluated under the following three criteria.

- **Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project:** A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.
- **Consistent with the BDCP overall goals and objectives:** The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.
- **Practicability:** The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

In the following subsections, the level of incidental take expected to be reduced is evaluated. Evaluation of conservation benefits likely to accrue, consistency with the BDCP overall goals and objectives, and practicability would be discussed in Section 9.4, *Conclusions*.

Table 9-5. Alternatives to Take Evaluation Summary: Fish

Alternative	Evaluation Criteria										
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project						Consistent with the BDCP overall goals and objectives		Practicability		
	Central Valley steelhead	Sacramento River winter-run Chinook salmon	Central Valley spring-run Chinook salmon	Central Valley fall- and late fall-run Chinook salmon	Delta smelt	Longfin smelt	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A							Yes	Yes	No	No	No
B							Yes	Yes	Yes	No	Yes
C	*	*	--	*	*						
D											
E											
F											
G											
H											
I											

Notes

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

Table 9-6. Alternatives to Take Evaluation Summary: Fish

Alternative	Evaluation Criteria									
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project					Consistent with the BDCP overall goals and objectives		Practicability		
	Sacramento splittail	White sturgeon	North American green sturgeon	Pacific lamprey	River lamprey	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A						Yes	Yes	No	No	No
B						Yes	Yes	Yes	No	Yes
C	*	*	--	*	*					
D										
E										
F										
G										
H										
I										

Notes

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

1 **Table 9-7. Alternatives to Take Evaluation Summary: Mammals**

Alternative	Evaluation Criteria										
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project						Consistent with the BDCP overall goals and objectives		Practicability		
	San Joaquin kit fox	Riparian woodrat	Salt marsh harvest mouse	Riparian brush rabbit	Townsend's big-eared bat	Suisun shrew	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A							Yes	Yes	No	No	No
B							Yes	Yes	Yes	No	Yes
C	*	*	--	*	*						
D											
E											
F											
G											
H											
I											
J											
K											
L											
M											
N											
O											

Notes

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

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Table 9-8. Alternatives to Take Evaluation Summary: Birds

Alternative	Evaluation Criteria										
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project						Consistent with the BDCP overall goals and objectives		Practicability		
	Tricolored blackbird	Suisun song sparrow	Yellow-breasted chat	Least Bell's vireo	Western burrowing owl	Western yellow-billed cuckoo	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A							Yes	Yes	No	No	No
B							Yes	Yes	Yes	No	Yes
C	*	*	--	*	*						
D											
E											
F											
G											
H											
I											

Notes

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

Table 9-9. Alternatives to Take Evaluation Summary: Birds

Alternative	Evaluation Criteria										
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project						Consistent with the BDCP overall goals and objectives		Practicability		
	California least tern	Greater sandhill crane	California black rail	California clapper rail	Swainson's hawk	White-tailed kite	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A							Yes	Yes	No	No	No
B							Yes	Yes	Yes	No	Yes
C	*	*	--	*	*						
D											
E											
F											
G											
H											
I											

Notes:

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

Table 9-10. Alternatives to Take Evaluation Summary: Reptiles and Amphibians

Alternative	Evaluation Criteria									
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project					Consistent with the BDCP overall goals and objectives		Practicability		
	Giant garter snake	Western pond turtle	California red-legged frog	Western spadefoot toad	California tiger salamander	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A						Yes	Yes	No	No	No
B						Yes	Yes	Yes	No	Yes
C	*	*	--	*	*					
D										
E										
F										
G										
H										
I										

Notes:

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

Table 9-11. Alternatives to Take Evaluation Summary: Invertebrates

Alternative	Evaluation Criteria												
	Level of Incidental Take Expected to Result or Conservation Benefit Likely to Accrue compared to Proposed Project								Consistent with the BDCP overall goals and objectives		Practicability		
	Lange's metalmark butterfly	Valley elderberry longhorn beetle	Vernal pool tadpole shrimp	Conservancy fairy shrimp	Longhorn fairy shrimp	Vernal pool fairy shrimp	Midvalley fairy shrimp	California linderiella	Ecosystem Restoration	Water Supply Reliability	Cost	Logistics	Technology
A									Yes	Yes	No	No	No
B									Yes	Yes	Yes	No	Yes
C	*	*	--	*	*								
D													
E													
F													
G													
H													
I													

Notes

Level of incidental take expected to result or conservation benefit likely to accrue compared to proposed project: A 5-point bubble scale is used to indicate how the level of take or conservation benefit is expected to change for a species compared to the proposed project.

* take is likely to increase substantially.

* take is likely to increase measurably but not substantially.

-- no change in take or conservation benefit is likely to occur.

* conservation benefit is likely to increase measurably but not substantially.

* conservation benefit is likely to increase substantially.

Consistent with the BDCP overall goals and objectives: The consistency of each alternative to take with BDCP goals and objectives is indicated by *yes* or *no*.

Practicability: The practicability with regard to cost, logistics, and technology for each alternative to take is indicated by *yes* or *no*.

9.3.1 Fish

Each alternative to take is evaluated to assess how take of fish species would be expected to change. This section summarizes the results of the evaluation, and focuses on those alternatives to take that would reduce or avoid take of one or more fish species. Alternatives to take that increase take of covered fish (if any alternatives do so) are mentioned but are not the focus of the analysis. Table 9-12 provides a qualitative summary of how take of fish, by species and life stage, is expected to change under each alternative to take.

9.3.2 Mammals

Each alternative to take is evaluated to assess how take of mammal species would be expected to change. This section summarizes the results of the evaluation, and focuses on those alternatives to take that would reduce or avoid take of one or more mammal species. Alternatives to take that increase take of covered mammals (if any alternatives do so) are mentioned but are not the focus of the analysis. Table 9-13 provides a qualitative summary of how take of mammals, by species, is expected to change under each alternative to take.

9.3.3 Birds

Each alternative to take is evaluated to assess how take of bird species would be expected to change. This section summarizes the results of the evaluation, and focuses on those alternatives to take that would reduce or avoid take of one or more bird species. Alternatives to take that increase take of covered birds (if any alternatives do so) are mentioned but are not the focus of the analysis.

Table 9-14 provides a qualitative summary of how take of birds, by species, is expected to change under each alternative to take.

9.3.4 Reptiles and Amphibians

Each alternative to take is evaluated to assess how take of reptile and amphibian species would be expected to change. This section summarizes the results of the evaluation, and focuses on those alternatives to take that would reduce or avoid take of one or more reptile and amphibian species. Alternatives to take that increase take of covered reptiles and amphibians (if any alternatives do so) are mentioned but are not the focus of the analysis.

Table 9-15 provides a qualitative summary of how take of reptile and amphibian, by species, is expected to change under each alternative to take.

9.3.5 Invertebrates

Each alternative to take is evaluated to assess how take of invertebrate species would be expected to change. This section summarizes the results of the evaluation, and focuses on those alternatives to take that would reduce or avoid take of one or more invertebrate species. Alternatives to take that increase take of covered invertebrate (if any alternatives do so) are mentioned but are not the focus of the analysis. Table 9-16 provides a qualitative summary of how take of reptile and amphibian, by species, is expected to change under each alternative to take.

Table 9-12. Summary of Expected Changes to Take by Alternative for Fish Species

Species/ Life Stage	Alternative	Aquatic Species Effects						
		Entrainment	Flow, Passage, Temperature, Salinity	Toxics	Habitat Restoration	Fish Population	Ecological	Construction
Total								

Symbols:
0 = no change from proposed project, take would be the same or nearly the same
- = negative effects reduced, take would be reduced
+ = negative effects increased, take would be increased
n/a = no effect from proposed project or alternative

Table 9-13. Summary of Expected Changes by Alternative to Take for Mammals

Species	Alternative	Species Effects								
		Habitat Removal			Habitat Degradation			Effects Extending Beyond Disturbance Locations		
		Permanent	Temporary	Periodic	Permanent	Temporary	Periodic	Permanent	Temporary	Periodic
Total										

Symbols:
0 = no change from proposed project, take would be the same or nearly the same
- = negative effects reduced, take would be reduced
+ = negative effects increased, take would be increased
n/a = no effect from proposed project or alternative

Table 9-14. Summary of Expected Changes by Alternative to Take for Birds

Species	Alternative	Species Effects								
		Habitat Removal			Habitat Degradation			Effects Extending Beyond Disturbance Locations		
		Permanent	Temporary	Periodic	Permanent	Temporary	Periodic	Permanent	Temporary	Periodic
Total										

Symbols:
0 = no change from proposed project, take would be the same or nearly the same
- = negative effects reduced, take would be reduced
+ = negative effects increased, take would be increased
n/a = no effect from proposed project or alternative

Table 9-15. Summary of Expected Changes by Alternative to Take for Reptiles and Amphibians

Species	Alternative	Species Effects								
		Habitat Removal			Habitat Degradation			Effects Extending Beyond Disturbance Locations		
		Permanent	Temporary	Periodic	Permanent	Temporary	Periodic	Permanent	Temporary	Periodic
Total										

Symbols:
0 = no change from proposed project, take would be the same or nearly the same
- = negative effects reduced, take would be reduced
+ = negative effects increased, take would be increased
n/a = no effect from proposed project or alternative

Table 9-16. Summary of Expected Changes by Alternative to Take for Invertebrates

Species	Alternative	Species Effects								
		Habitat Removal			Habitat Degradation			Effects Extending Beyond Disturbance Locations		
		Permanent	Temporary	Periodic	Permanent	Temporary	Periodic	Permanent	Temporary	Periodic
Total										

Symbols:
0 = no change from proposed project, take would be the same or nearly the same
- = negative effects reduced, take would be reduced
+ = negative effects increased, take would be increased
n/a = no effect from proposed project or alternative

9.4 Conclusions

Evaluation of conservation benefits likely to accrue, consistency with the BDCP overall goals and objectives, and practicability is discussed in this section.

9.5 References

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1996. Habitat Conservation Planning and Incidental Take Permit Processing Handbook. November 4. Available: <http://www.nmfs.noaa.gov/pr/pdfs/laws/hcp_handbook.pdf>.